PCT WELTORGANISATION FÜR GEISTIGES EIGENTUM
Internationales Büro
INTERNATIONALE ANMELDUNG VERÖFFENTLICHT NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT)

(51) Internationale Patentklassifikation 7 : G08B 7/06, 17/00 — A1

(11) Internationale Veröffentlichungsnummer: WO 00/14693

(43) Internationales Veröffentlichungsdatum: 16. März 2000 (16.03.00)

(21) Internationales Aktenzeichen: PCT/CH99/00413

(22) Internationales Anmeldedatum: 7. September 1999 (07.09.99)

(30) Prioritätsdaten:
98117034.3 9. September 1998 (09.09.98) EP
2467/98 11. Dezember 1998 (11.12.98) CH

(71) Anmelder: SIEMENS BUILDING TECHNOLOGIES AG [CH/CH]; Cerberus Division, Alte Landstrasse 411, CH-8708 Männedorf (CH).

(72) Erfinder: CORDASCO, Gerald, M.; 69 Lexington Avenue, Maplewood, NJ 07040 (US). WIESER, Dieter; Lindenbergstrasse 10, CH-8700 Küsnacht (CH).

(81) Bestimmungsstaaten: AU, CN, CZ, HU, IN, KR, NO, PL, europäisches Patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

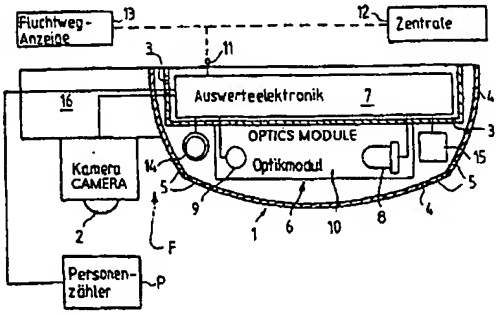
Veröffentlicht
Mit internationalem Recherchenbericht.

(54) Title: FIRE ALARM AND FIRE ALARM SYSTEM

(54) Bezeichnung: BRANDMELDER UND BRANDMELDEANLAGE

(57) Abstract

The invention relates to a fire alarm (F) comprising at least one sensor (6, 14, 15) for detecting fire parameters and an evaluation circuit (7) which triggers an alarm signal if a defined first value is exceeded by a corresponding fire parameter. The at least one sensor (6, 14, 15) also monitors a second, greater value of the fire parameter concerned and if said second value is exceeded triggers an alarm signal which indicates that a corresponding escape route can no longer be used. The fire alarm system comprises a central unit (12) to which fire alarms (F) are connected and an escape route indicator system with adjustable indicator means (13). In the area of the escape routes the invention further provides for fire alarms, referred to hereafter as escape route indicators (F), for the additional monitoring of fire parameters for life-threatening values, and/or means for monitoring the people flow along a corresponding escape route, referred to as people flow meters (P). The indicator means (13) are controlled on the basis of said additional monitoring.



13...ESCAPE ROUTE INDICATORS
12...CENTRAL UNIT
7...EVALUATION ELECTRONICS
P...PEOPLE COUNTER

Fire alarm and fire alarm system

The present invention relates to a fire alarm with at least one sensor for detecting at least one fire characteristic and with an evaluating circuit by means of which an alarm is activated when a predetermined first value is exceeded by the respective fire characteristic.

Regardless of the principle of detection employed, known fire alarms of this type are so designed that the alarm is activated at values of the fire characteristics which are as low as possible, but without obtaining unacceptable false alarms. Owing to improvements with regard to the sensors and also the processing and evaluation of the sensor signals, which have been made in recent years, some types of fire alarm have now attained a standard at which these two requirements are completely satisfied, for example the alarms described in EP-A-0 654 770, EP-A-0 654 771, EP-A-0 660 282, EP-A-0 718 814, EP-A-0 821 330 and WO-A-98/15931.

As the activation of a fire alarm does not generally prevent the fire from developing unless the alarm activates an automatic extinguisher, a burning building often has to be evacuated in the event of fire. In one such case, on the one hand, it is important for the people to be evacuated to know which and where the safe escape routes are and, on the other hand, it is also important for the Commander of the Fire Brigade to possess this information. Thus, for example, it is of limited or no use if a hotel guest has information about the possible escape route in his room without at the same time being advised whether this or which escape route is still safe.

With so-called voice systems, the people inside the burning building receive acoustic evacuation instructions, but the people giving the respective instructions, for example the Commander, generally cannot ascertain quickly and reliably which escape routes are still safe to use.

Simulation systems are available nowadays which allow predictions to be made about the propagation of a fire. However, even if it is assumed that such a system possesses all the necessary sensors and has knowledge of all prevailing parameters of the building such as type of floor coverings and furniture, presence of combustible material such as paper and cardboard in rooms and corridors etc., it still cannot provide reliable information about the usability of an escape route.

Thus, for example, DE-A-196 44 127 describes an evacuation system with variable direction signs for the escape route which can be adapted to the respective hazard, which comprises detectors for recognition and location of the hazard, a central detection means for automatic activation of the evacuation system and risk-oriented automatic control of the escape route signs, but there are no precise details about practical implementation of this system. Although, it is mentioned that the danger potential is determined on line in the event of fire and an optimised evacuation plan is defined, there are no details as to how the danger potential is reliably to be determined, apart from a reference to a so-called modular people saving expert system. For an optimised evacuation plan, it is not sufficient to know where the fire is and how this fire will perhaps spread, concrete and not merely calculated information about the usability of the escape routes being required.

Acknowledging the fact that human life cannot be entrusted to the calculations of expert systems, the present invention has a quite different starting point, with the object of providing a fire alarm which, in addition to its normal function of recognizing low values of fire characteristics with great protection from false alarms, supplies reliable information about the state of escape routes.

The invention provides a fire alarm with at least one sensor for detecting at least one fire characteristic and with an evaluating circuit for activating an alarm when a predetermined first value is exceeded by the respective fire characteristic, characterised in at least one sensor for monitoring a second, higher value of the respective fire characteristic, and control means for activating a second alarm when this second value is exceeded, indicating the unusableness of a particular escape route.

The invention also provides a fire alarm system having a control centre, fire alarms connected to the control centre and disposed in the region of escape routes and hereinafter denoted as escape-route detectors, and an escape route display system with adjustable display means controllable by the escape-route detectors, characterised in that the escape-route detectors are fire detectors that have at least one sensor for the detection of at least one fire characteristic and trigger a fire alarm when a predetermined first value is exceeded by the respective fire characteristic, and in that a second, higher value of the respective fire characteristic is additionally monitored and, if said second value is exceeded, an alarm signal is triggered to indicate that the affected escape route is unusable.

A first preferred embodiment of the fire alarm according to the invention is characterised in that said second value of the fire characteristic represents a life-threatening value.

The fire alarm according to an embodiment contains, for each fire characteristic, at least one second threshold value and, when said threshold value is exceeded, activates an alarm signal which displays the unusability of the respective escape route. Depending on the fire characteristic, this second threshold value can be, for example, a life-threatening smoke gas or carbon monoxide concentration or a life-threatening temperature or also a life-threatening radiation pressure, the fire alarm being equipped with corresponding sensors. As soon as the second or a second threshold value is exceeded, the control centre or a special device, for example a pager or the like, receives a corresponding signal and the Commander knows that the respective escape route is unusable and therefore has the opportunity to block this escape route.

The second threshold value can obviously also be allocated a somewhat smaller third threshold value corresponding to a pre-alarm, so the control centre also receives information as to which escape route will probably become unusable in the foreseeable future.

A second preferred embodiment of the fire alarm according to the invention is characterised by optical and/or acoustic display and/or alarm means which can be activated by said alarm signal. These means can be provided on the alarm itself, but it is also possible to arrange them at suitable points at some distance from the alarms, for example at the entrances to corridors or stairwells.

A further preferred embodiment of the fire alarm according to the invention is characterised by a camera for monitoring the space surrounding the alarm and by means for the controlled transmission of the respective images recorded by the camera to a central evaluation and/or observation station which preferably forms part of the control centre of a fire alarm system.

Whereas with the formerly described embodiments, information flows only in the direction from the alarms to the control centre and the control centre or the Commander posted there has no influence on the flow of information, the fire alarm equipped with the camera enables the Commander intentionally to observe certain spaces or escape routes optically and to be made aware of hazardous situations which are possibly not recognisable as such by the sensors of the fire alarm. It can therefore be established, in particular, whether an escape route is still sufficiently constructionally/mechanically intact to be used safely. And it is possible to discover injured or unconscious people and to get their rescue under way.

The invention also relates to a fire alarm system with a control centre, with fire alarms connected thereto and with an escape route display system with adjustable display means. The fire alarm system according to the invention is characterised in that, in the region of the escape routes there are provided fire alarms, hereinafter called escape route detectors, by means of which fire characteristics are monitored for life-threatening values and in that the display means are controlled by means of this additional monitoring.

Said display means can be, for example, simple displays in the form of the arrows which are normal nowadays or also complex display panels for entire buildings or parts of buildings or also display means provided directly on the escape route detectors, the unusable escape routes being accordingly marked by means of said additional monitoring in each case.

In a hotel room, the escape route could be formed, for example, by an electronic display panel on which the free escape routes are marked with green arrows and the blocked

escape routes with green arrows marked through with red. In addition, the escape routes which will be the next to become unusable can be correspondingly marked by suitable warning symbols.

A first preferred embodiment of the fire alarm system according to the invention is characterised in that, in the region of the escape routes, means hereinafter called people counters are provided in the respective escape route for monitoring the flow of people and in that the display means are controlled by means of this monitoring.

This embodiment has the advantage that the system provides reliable information about the flow of people in the escape routes and therefore allows overloaded escape routes to be blocked.

A second preferred embodiment of the fire alarm system according to the invention is characterised in that the escape route detectors and/or the people counters are connected directly to the respective display means.

Local escape route control is therefore effected in this way, an escape route detector and/or people counter installed in a corridor, for example, being connected to the display arranged at the access to this corridor. The escape route detectors and/or people counters mounted in a stairwell or in a main corridor are similarly connected to the displays mounted in the accesses or side entrances to the stairwell or main corridor, so these accesses or side entrances can be marked as unusable.

The connection of the escape route detectors and/or people counters to the display means can obviously also extend via the control centre, but it may be worthwhile under certain circumstances, for example as protection in the event of failures, if the escape route is controlled locally.

A third preferred embodiment of the fire alarm system according to the invention is characterised in that the people counters are integrated into the escape route detectors.

A further preferred embodiment of the fire alarm system according to the invention is characterised by a computer to which all fire alarms and people counters are connected and supply current fire and escape route data, the most desirable escape routes being calculated and the display means being accordingly connected by said computer in the event of an alarm. With the fire alarms (normal fire alarm plus escape route detector) and the people counters and the display elements, the computer with the corresponding software forms an evacuation system.

Said software can also contain a fire simulation system which allows simulation of the serious case in the alarm-free state, and this is very useful for planning of the system and the escape routes, in particular in the case of new or special use of spaces. With such a fire simulation system, for example, the functioning of the system (escape route detector plus people counter plus display elements) can be played through for a given population of the building and a given danger and the system can be tested and optimised.

However, evacuation in the event of an alarm must not be based on a theoretical model of a simulated fire, but must take place with reference to the actual conditions which are supplied by the escape alarm and people counter data. The evacuation system according to the invention therefore differs substantially from all simulated fire or evacuation models to which no people counters and/or escape route detectors are connected.

Furthermore, the evacuation system can additionally provide a graphic illustration of the building and of the local threat, which can be very useful for the Commander. Furthermore, the fire alarm system according to the invention can also be connected to a voice system.

According to a further preferred embodiment of the fire alarm system according to the invention, the people counters are designed in the form of a light barrier or a light curtain and are equipped for counting the people passing their range of detection. As a further variation, people can be counted by image processing, a CMOS technology camera, for example, being used.

The invention is described in more detail hereinafter with reference to an embodiment and the drawings, in which:
Fig. 1 shows schematic detail of an example of an

embodiment of a fire alarm system according to the invention;
Fig. 2 shows schematic detail of another example of an embodiment of a fire alarm system according to the invention.

The detail of a fire alarm system according to the invention illustrated in Fig. 1 shows an escape route detector F and a people counter P which are connected to a control centre 12 and an escape route display 13. The escape route detector F contains an optical fire alarm 1, for example a scattered light or a point extinction detector which is enlarged by additional sensors for fire characteristics. These additional sensors are a CO sensor 14 which forms the actual core of the escape route detector F and a temperature sensor 15. A radiation pressure sensor (not shown) can optionally also be provided.

The CO sensor is described as core because by far the most fatalities in fires are due to CO poisoning. A suitable CO sensor is described in EP-B-0 612 408 (see also EP-A-0 803 850),

and NTC thermistors have proven suitable as temperature sensors (cf. the *PolyRex* smoke alarm of the *AlgoRex* fire alarm system; *PolyRex* and *AlgoRex* are registered trade marks belonging to Cerberus AG).

As optical alarms resembling the fire alarm 1 are assumed to be known, they will not be described in detail here. In this connection, reference will be made to the following patent applications EP-A-0 616 305, EP-A-0 813 178, EP-A-0 821 330 and EP-A-0 886 252. As an option, the escape route detector F contains a camera 2 in addition to the fire alarm 1. The illustrated fire alarm 1 consists, in a known manner, of an alarm insert 3 which can be fastened in a base (not shown) and of an alarm cap 4 which can be slipped over the alarm insert 3 and is provided with smoke inlet orifices 5 in its crest region. The alarm insert 3 essentially contains an optical module 6 and an electronic valuation unit 7.

In the case of a scattered light alarm, the optical module 6 essentially consists of a measurement chamber 10 which contains a light source 8 and a light receiver 9 and is shielded from external light from the exterior by means, not shown. The optical axes of the light source 8 formed by an infrared or a red or blue light emitting diode (IRED or LED) and of the light receiver 9 are kinked toward one another, this course and shutters preventing rays of light from being able to pass directly from the light source 8 to the light receiver 9. The light source 8 transmits short, intensive light pulses into the central part of the measurement chamber 10 described as scatter chamber, the light receiver 9 "seeing" the scatter chamber but not the light source 8.

The light from the light source 8 is scattered by smoke penetrating into the scatter chamber, and a proportion of this scattered light impinges on the light receiver 9. The receiver signal thus produced is processed by the electronic evaluation unit 7. During processing, the receiver signal is compared in a known manner with an alarm threshold and at least one pre-alarm threshold, and the evaluating electronic unit 7 emits an alarm signal at an output 11 when the alarm threshold hereinafter called fire alarm threshold is exceeded by the receiver signal. Intelligent signal processing using, for example, fuzzy logic or a neural network ensures that the alarm signal is emitted at smoke values which are as low as possible, but without unacceptable false alarms occurring.

In addition to said thresholds, the electronic evaluation unit 7 contains a further alarm threshold hereinafter called escape route detector threshold, which is substantially higher than the fire alarm threshold and corresponds to a life-threatening smoke density value of, for example, 10% per metre. The electronic evaluation unit 7 obviously has to be so

designed that a correspondingly great dynamic range can be processed. With the illustrated smoke alarm, therefore, the receiver signal is still observed even after activation of a fire alarm and it is investigated whether the receiver signal also exceeds the escape route detector threshold. Depending on the signal trend, a single additional bit for "escape route safe" or "escape route unsafe" (hazardous) is transmitted via the output 11, for example in a simple embodiment, and, in the case of "escape route unsafe", this bit indicates that the respective escape route is unpassable.

Said bit is transmitted to the control centre 12 of the fire alarm system and optionally to an adjustable escape route display 13 connected to the respective fire alarm and controlled by it, and causes the escape route monitored by the respective fire alarm to be blocked, either via control centre 12 or directly by the escape route display 13 connected to the alarm. The display can be, for example, one of the conventional illuminated displays for an emergency exit which glows green in the case of passability and red in the case of unpassability, wherein the colours can be promoted by corresponding pictograms. The information "escape route unsafe" can also be transmitted to the advancing Fire Brigade by remote transmission.

The electronic evaluation unit 7 also contains fire alarm thresholds and additional escape route detector thresholds for the CO sensor 14 and the temperature sensor 15, the escape route detector threshold of the CO sensor 14 corresponding, for example, to 1,000 to 1,500 ppm of CO and the escape route detector threshold of the temperature sensor 15, for example, to about 60°C. As with the smoke density, the electronic evaluation unit 7 monitors the receiver signals of the CO sensor 14 and of the temperature sensor 15 and delivers a corresponding signal to the output 11 when the respective escape route detector thresholds are exceeded, so an additional bit for "escape route free" or "escape route unsafe" is also transmitted to the control centre 12 or to the escape route display 13 connected to the alarm here and the escape route is blocked in the case of "escape route unsafe".

The people counter P is designed in the form of a light barrier or a light curtain and consists, for example, of two active infrared alarms which each contain an active light source and a receiver with an electronic evaluation unit. An arrangement of this type is described, for example, in EP-A-0 845 765. The people counter P, which is connected to the control centre 12 and the escape route display 13 either directly or via the escape route detector F counts the flow of people in the respective escape route. The measured value is compared in the corresponding electronic evaluation unit, provided either in the people counter P or in the escape route detector F or optionally in the control centre 12, with an alarm threshold value,

on the exceeding of which the escape route display 13 is so activated that the respective escape route is blocked. The people counter P can be integrated into the escape route detector F or can be installed separately from it.

The camera 2 is preferably arranged in a carrier part 16 which is connected to the fire alarm 1, is worked onto it and comprises a stage (not shown) for processing the camera signals of which the output is connected to the electronic evaluation unit 7. The camera 2 is always ready to take a shot but does not as such supply pictures of the monitored space to the control centre 12. This occurs only on the basis of a corresponding command from the control centre 12. In this way, the Commander is able to check escape routes by remote control and to block them if he feels that they are no longer safe. He can also observe events in the escape routes, so injured or unconscious people can be rescued promptly. However, it would also be possible to use the camera for counting people.

Alternatively, the camera 2 can also be activated automatically by the exceeding of an escape route threshold of the escape route detector F or of the people counter P and can transmit images to the control centre 12. It is important that the connection formed, for example, by a data bus between alarm 1 and control centre 12 is not blocked by image signals from the camera 2 in the alarm stage, so alarm signals are able to pass from the various sensors to the control centre 12 at any time and without delay. On the other hand, it is more important at the moment when the sensors have responded and a fire alarm has already been activated or an escape route alarm threshold has been exceeded, that the Commander can monitor the escape routes because the possibility of saving human life is drastically improved in this way.

Obviously, the camera 2 does not have to be constructionally connected to the alarm 1 but can also be arranged at a certain distance from it, but this necessitates additional expenditure on wiring. The camera 2 is preferably a CMOS technology camera, wherein the processor of the alarm 1 compresses the pictures taken by the camera so they can be transmitted via a conventional data bus at a frequency of about 5 pictures per minute, the transmission rate being dependent on the occupancy of the bus.

The control centre 12 can contain a computer with suitable evacuation software to which all people counters P and all fire alarms of the system, the escape route detector F and the "normal" fire alarm are connected. A software tool suitable for these purposes is known by the name "exodus". In the event of an alarm, the fire alarms supply current fire and escape route data and the people counters P also supply current escape route data to the computer

which uses this data to calculate the most desirable escape routes and switches the escape route displays 13 accordingly.

The control centre 12 with the computer and the connected peripherals forms an evacuation system which can be supplemented by fire simulation software. The fire simulation software allows simulation of the serious case in the absence of a fire, and this can be very useful for planning the system and the escape routes or for new or special use of spaces.

Fig. 2 is a schematic view of a rectangular stairwell S into which four side entrances G open. The stairwell S is closed at each side entrance G by a door T, on both sides of which a respective escape route display 13 is arranged. The side entrance-side escape route display is designated in each case by 13 and the stairwell side escape route display by 13'. Escape route detectors F are also installed in the stairwell S and in the side entrances G, the escape route detector(s) in the stairwell S being connected to the side entrance-side escape route displays 13. Each escape route detector F in a side entrance G is connected to the escape route display 13' arranged on the stairwell side of the door T closing the respective side entrance.

People counters P which are connected via the escape route detector F arranged in their vicinity or directly to the escape route display 13' arranged on the stairwell side of the door T closing the respective side entrance G are arranged in the side entrances G. People counters P can also be arranged in the stairwell S; however, the flow of people in the stairwell S is preferably calculated from the data of the side entrances G opening into the stairwell S and branching from it.

If the escape route detector(s) F in the stairwell S detect that the escape route alarm threshold has been exceeded or if the values of the people counters P indicate that the stairwell S is overfull, all associated side entrance-side escape route displays 13 are switched to unpassable so access from the side entrances G into the stairwell S is blocked. If an escape route detector F or a people counter P in a side entrance G detects that an escape route alarm threshold has been exceeded, the escape route display 13' on the stairwell side of the door T closing this side entrance is switched to unpassable and access to this side entrance therefore blocked.

The example used mainly to illustrate the mode of operation of a fire alarm system equipped with escape route detectors and people counters in Fig. 2 should not be understood as restrictive. It is obvious to a person skilled in the art that communication between escape route detectors F and people counters P on the one hand and escape route displays 13, 13'

on the other hand is not restricted to the direct connection illustrated and can be achieved in a variety of ways. As already mentioned, communication can also be effected via the control centre 12 (Fig. 1) and additionally to the Fire Brigade. Similarly, communication is not restricted to a data bus but can obviously also be effected wirelessly or in a so-called hybrid system.

It will also be advantageous to interconnect the escape route displays in the entire building or in the individual storeys or wings of buildings and thus to enable commands for blocking escape routes to be relayed from escape route display to escape route display, ensuring that the foremost display of each escape route displays its current state in each case.

It is to be understood that the prior art publications referred to herein, do not constitute an admission that that the publication forms a part of the common general knowledge in the art, in Australia or in any other country.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A fire alarm with at least one sensor for detecting at least one fire characteristic and, an evaluating circuit for activating an alarm when a predetermined first value is exceeded by the respective fire characteristic, characterised in at least one sensor for monitoring a second, higher value of the respective fire characteristic, and control means for activating a second alarm when this second value is exceeded, indicating the unusableness of a particular escape route.

2. Fire alarm according to claim 1, characterised in that said second value of the fire characteristic represents a life-threatening value.

3. Fire alarm according to claim 1 or 2, characterised in that the alarm and the second alarm comprise an optical and/or acoustic display which can be activated by said evaluating circuit and control means.

4. Fire alarm according to claim 3, characterised in that said display is provided on the fire alarm.

5. Fire alarm according to claim 3, characterised in that said display is an escape route display installed at a distance from the fire alarm.

6. Fire alarm according to claim 3, further including a camera for monitoring an area surrounding the fire alarm and for producing respective images recorded by the camera to a central evaluation and/or observation station.

7. Fire alarm according to any one of claims 1 to 6, characterised in that the at least one sensor is formed by a smoke and/or combustion gas sensor.

8. Fire alarm according to claim 7, characterised in that the at least one sensor is formed by an optical smoke sensor and in that the fire alarm also comprises a CO sensor and/or a temperature sensor and/or a sensor for radiation pressure.

9. Fire alarm according to claim 6, characterised in that the camera is installed in a carrier mechanically connected to the fire alarm.

10. Fire alarm according to claim 6, characterised in that the camera is installed in a carrier spatially separated from the fire alarm.

11. Fire alarm according to any one of claims 1 to 10 wherein the control means and the evaluation circuit are one and the same circuit.

12. Fire alarm according to any one of claims 1 to 11, wherein the alarm and the second alarm are a common alarm and the common alarm is controlled to display a predetermined display when the second fire characteristic is monitored to indicate the unusableness of the escape route.

13. Fire alarm according to claim 11 wherein the common evaluating circuit is connected to a central control station.

14. Fire alarm system having a control centre, fire alarms connected to the control centre and disposed in the region of escape routes and hereinafter denoted as escape-route detectors, and an escape route display system with adjustable display means controllable by the escape-route detectors, characterised in that the escape-route detectors are fire detectors that have at least one sensor for the detection of at least one fire characteristic and

trigger a fire alarm when a predetermined first value is exceeded by the respective fire characteristic, and in that a second, higher value of the respective fire characteristic is additionally monitored and, if said second value is exceeded, an alarm signal is triggered to indicate that the affected escape route is unusable.

15. Fire alarm system according to claim 14, characterised in that people counters are provided in the respective escape route for monitoring the flow of people, and the control means additionally controls the display means in response to the people counters.

16. Fire alarm system according to claim 15, characterised in that the fire alarms and/or the people counters are connected directly to the respective display means.

17. Fire alarm system according to claim 16, characterised in that the people counters are integrated into the fire alarms.

18. Fire alarm system according to any one of claims 14 to 17, characterised in that the fire alarms are equipped with a camera for the video monitoring of the area to be monitored.

19. Fire alarm system according to claim 18, characterised in that the camera forms part of an intrusion alarm connected to the fire alarms.

20. Fire alarm system according to claim 17, characterised in that the people counters are connected to the escape route alarms and in that the signals from the people counters are transmitted to the fire alarms and from there to the display means and/or to the control centre.

21. Fire alarm system according to any one of claims 15 to 20, characterised by a computer to which all fire alarms and people counters are connected, for processing supply current fire and escape route data, the most desirable escape routes being calculated and the display means being accordingly switched by said computer in the event of an alarm.

22. Fire alarm system according to claim 16 or 20, characterised in that the people counters are designed in the manner of light barriers or light curtains and are equipped for counting the people passing their range of detection.

23. Fire alarm system according to claim 22, characterised in that the people counters are each formed by two active infrared alarms which are mounted on mutually opposed walls and each contain an active light source and a receiver with an electronic evaluating unit.

24. Fire alarm system according to claim 22, characterised in that the people counters are each formed by an active infrared alarm which is mounted on the ceiling and contains an active light source and a receiver with an electronic evaluating unit.

25. Fire alarm system according to claim 16 or 20, characterised in that the people are counted by image processing.

26. Fire alarm system according to any one of claims 14 to 25, wherein the control means is an evaluator circuit which is also for monitoring a lower threshold fire characteristic to produce an alarm signal indicating a fire.

27. A fire alarm as claimed in any one of claims 1 to 13 and substantially as herein described with reference to the accompanying drawings.

28. A fire alarm system as claimed in any one of claims 14 to 26 and substantially as herein described with reference to the accompanying drawings.

Dated this 6th day of June 2003
SIEMENS BUILDING TECHNOLOGIES AG
By their Patent Attorneys
GRIFFITH HACK
Fellows Institute of Patent and
Trade Mark Attorneys of Australia

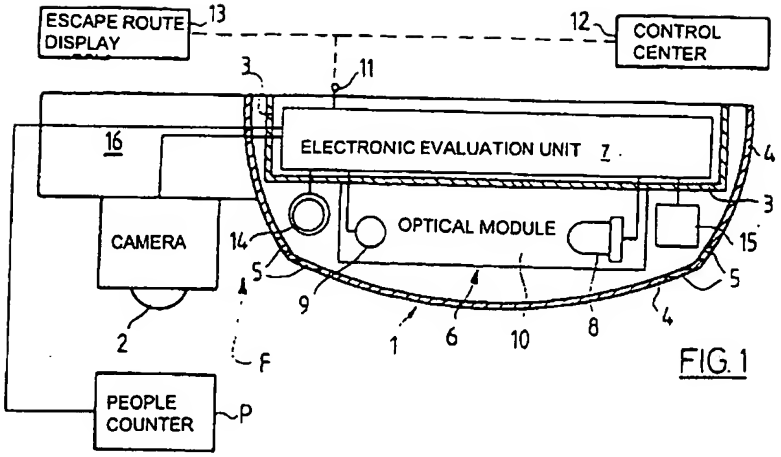

ESCAPE ROUTE DISPLAY
13
12
CONTROL CENTER
3
11
16
ELECTRONIC EVALUATION UNIT 7
4
3
CAMERA
14
OPTICAL MODULE
15
5
5
9
4
2
F
1
6
10
8
PEOPLE COUNTER
P

FIG. 1

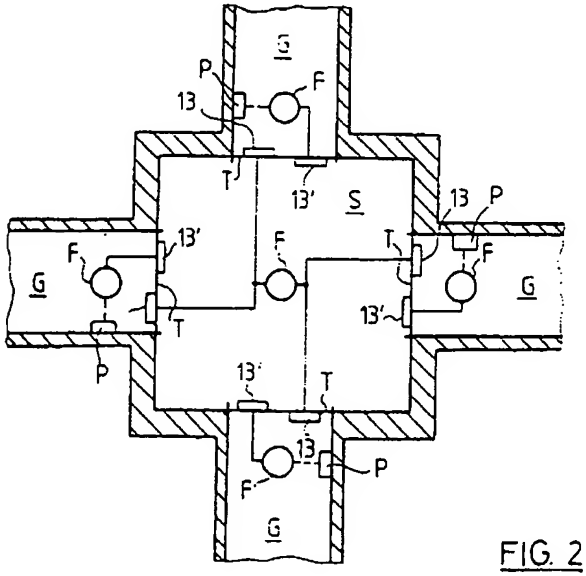

G
P
F
13
T
13'
S
13
P
13'
F
F
T
F
G
G
T
13'
P
13'
T
13
13
P
F
G

FIG. 2